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(54) **Edge Interface electrical connector and radiotelephone**

Elektrischer Randverbinder und Mobiltelefon

Connecteur électrique à interface latéral et radiotéléphone

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(56) References cited:
WO-A-95/17774
US-A- 5 259 769
US-A- 5 538 435

- **PATENT ABSTRACTS OF JAPAN vol. 014, no. 070 (E-0886), 8 February 1990 & JP 01 289190 A (MINOLTA CAMERA CO LTD), 21 November 1989**

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Description

Field of the Invention

[0001] The present invention relates generally to edge interface electrical connectors. The present invention relates to electrical contact configurations for radiotelephones.

Background of the Invention

[0002] Radiotelephones continue to grow in popularity because they enable flexible channels of communication. Conveniently, increasing numbers of radio-towers and satellite systems are generally each increasing user access to radiotelephone systems, even in rural or remote areas. This increased popularity produces a sophisticated consumer who can demand competing product specifications or criteria. For example, desired performance parameters typically include improved signal quality, operational features, and durability, while maintaining an aesthetically pleasing appearance. In addition, many users desire improved transportability, which in turn, generally dictates that the product configuration be provided as a slim and miniaturized design which can impact other performance parameters.

[0003] As noted above, many of the more popular hand-held telephones are undergoing miniaturization. Indeed, many of the contemporary models are only 11-12 centimeters in length. Portable radiotelephones employ an internally disposed printed circuit board which generally controls the operation of the radiotelephone. Because the printed circuit board is disposed inside the radiotelephone, its size is also shrinking, corresponding to the miniaturization of the portable radiotelephone. Unfortunately, desirable operational and performance parameters of the radiotelephone can potentially require a large amount of dedicated space on the surface of the printed circuit board. Therefore, it is desirable to efficiently and effectively utilize the limited space on the printed circuit board.

[0004] This miniaturization can also create complex mechanical and electrical connections with other components, such as exterior mounted accessories and batteries which must generally interconnect with the housing for mechanical support and to the internally disposed printed circuit board for electrical interconnection. For example, battery connections traditionally have been constructed by spring contacts which are mounted in an intermediate position in the housing such that they longitudinally extend between the housing and printed circuit board (*i.e.*, are sandwiched) to rest against on the contacts on the surface of the printed circuit board. Unfortunately, this configuration can position the electrical contacts relatively close together which can potentially allow users to inadvertently short circuit the contacts. This can occur when a user positions a conductive object such as metallic keys in close proximity to the telephone systems connector or loose spare battery such that the key(s) shorts across the two contacts. Additionally, the configuration typically requires a dedicated keep-out zone in an area adjacent the contacts on the printed circuit board because the ends of the spring contacts can deform and extend into proximate areas around the contact pads themselves. Unfortunately, this keep-out zone can waste valuable board space.

[0005] **Figures 1A** and **1B** illustrate one example of a conventional portable radiotelephone **10** with spring connectors **70** used to interconnect the battery **60** through the housing **30** to the printed circuit board **50.** The spring connector **70** forms a contact angle **18** with the printed circuit board **50** surface when assembled. As shown in **Figure 1B,** the connector **70** is configured to rest against the printed circuit board contact pads **51, 52** and is typically associated with an adjacent keep-out zone **19.** Thus, as shown in **Figures 2A-2C,** when an external force is introduced onto the connector **70,** it is trapped by the surface of the printed circuit board and deformed. Unfortunately, this deformation can introduce permanent structural instabilities into the electrical contact potentially causing electrical malfunction or substandard performance. Further, this interconnection configuration generally uses a relatively large mounting or contact area on the surface of the printed circuit board **50.**

[0006] Another example of battery connectors is proposed in U.S. Patent No. 5,538,435 to Yohn. This reference describes an electrical input/output connector with switchable contacts for a portable apparatus such as a cellular telephone. The contacts which electrically connect the battery to the printed circuit board extend forwardly into and above the printed circuit board (substantially parallel to the direction of the major surfaces of the printed circuit board) to reside on a top major surface thereof.

Objects and Summary of the Invention

[0007] It is therefore an object of the present invention to provide improved radiotelephone interconnections for accessories and power supplies.

[0008] It is a further object of the present invention to provide an electronic connector interface which minimizes the amount of surface space needed on the printed circuit board.

[0009] It is an additional object of the invention to provide a connector which is easy to manufacture and resistant to inadvertent short circuiting by end users.

[0010] It is a further object of the invention to provide a radiotelephone with a battery interconnection configuration which is resistant to structural deformations introduced by external forces.

[0011] These and another objects, advantages, and features are provided by an edge interface connector, as defined by claim 13, which electrically interconnects a desired component to a printed circuit board disposed

in a device such as a radiotelephone. In particular, a first aspect of the invention is a radiotelephon, as defined by claim 1, which includes a front housing member and a rear housing member. The rear housing member is configured to overlay and matably connect with the front housing member to provide a channel therebetween. The rear housing member includes a battery chamber therein. The radiotelephone also includes a printed circuit board disposed in the channel intermediate of the front and rear housing members. The printed circuit board comprises a pair of battery edge contact pads thereon. The radiotelephone further includes at least one and typically a plurality of elongated spring contacts positioned in an end portion of the housing rear member such that said spring contacts electrically contact the printed circuit board battery edge contact pads. Preferably, the elongated spring contacts are positioned and configured such that they are free to vertically extend and retract about the printed circuit board according to external forces exerted thereon. Advantageously, unlike many conventional connectors, this configuration can reduce the potential for undesired deformation of the spring contacts.

[0012] In a preferred embodiment, the plurality of spring contacts include at least two contacts which are positive and negative spring contacts. The positive and negative spring contacts have upper and lower portions. A battery is positioned in the housing chamber such that the upper portions of the positive and negative spring contacts engage the respective battery positive and negative end contacts and the lower end portions contact corresponding ones of the battery edge contacts on the printed circuit board, defining a battery circuit therebetween. Advantageously, the positive and negative terminals and edge contacts can be spaced-apart, for example, on opposing sides of the printed circuit board, to minimize the potential for short circuiting across the terminals by an end user and reduces the use of valuable board space. This type of spreading or spacing of the contacts is not practical with conventional connector technology.

[0013] In an additional preferred embodiment, the elongated spring contacts include a support body positioned to hold the spring contact elements in proper alignment in the housing to assure electrical contact with the printed circuit board contact pads on one end and the component or externally mounted accessory (such as a battery) on the other end.

[0014] Accordingly, the edge interface connection is configured to be structurally flexible such that when a spring contact is assembled to the radiotelephone it minimizes the amount of space needed to electrically engage with the printed circuit board such that the elongated spring contact is free to vertically extend and retract about said printed circuit board according to external forces exerted thereupon.

[0015] An additional aspect of the present invention is an edge interface electrical connection. The connection comprises a connector support body having first and second sides and at least one connector upper contact extending from a first side of the support body. The connection also comprises at least one connector lower contact extending from a second side of the support body, wherein each of the connector upper contacts are electrically connected to corresponding ones of the at least one connector lower contacts. The connection further includes a printed circuit board having longitudinal and lateral surfaces and comprising at least one lateral edge contact pad on at least one lateral surface. The connector lower contact extends from the support body to a lateral surface of the printed circuit board to rest against and electrically connect with the printed circuit board edge contact pad. Preferably, the connector lower contact is configured in the support body such that it is free to extend upwardly and downwardly about the printed circuit board in response to forces exerted thereon.

[0016] In a preferred embodiment, the edge interface connector lower contact includes first and second segments. The second segment extends at an angle with respect to the first segment, and the second segment engages with the lateral edge contact such that it is free to extend upwardly and downwardly about the printed circuit board in response to forces exerted thereon. This configuration advantageously provides a larger contact surface to assure electrical contact between the lower contact and the printed circuit board, and can also provide a greater spring force to position the lower contact firmly against the desired printed circuit board contact. In one embodiment, the printed circuit board lateral edge contact includes electrical contact pads positioned in at least one cutaway inset in said printed circuit board. This cutaway can be electrically connected to the circuit on the printed circuit board, for example, with electrical vias therein.

[0017] The foregoing and other objects and aspects of the present invention are explained in detail in the specification set forth below.

Brief Description of the Drawings

[0018]

Figure 1A illustrates a prior art battery to printed circuit board connection in a radiotelephone.

Figure 1B illustrates a prior art connector as assembled to a printed circuit board.

Figure 2A illustrates the prior art connector of **Figure 1B** before an external force is exerted thereon.

Figure 2B illustrates the prior art connector of **Figure 1B** as deflected by an external force.

Figure 2C illustrates the prior art connector of **Figure 1B** after structural deformation.

Figure 3 is a sectional perspective view illustrating an edge interface connection of one embodiment of the present invention.

Figure 4 is an exploded view of a radiotelephone

employing the embodiment of the present invention shown in **Figure 3.**

Figure 5 is an end perspective view of an edge interface connection according to an additional embodiment of the present invention.

Figure 5A is a partial side view of the interface illustrated in **Figure 5.**

Figure 6 is a partial end perspective view of an edge interface connection according to another embodiment of the present invention.

Figure 7 is a partial perspective view of yet another embodiment of an edge interface connection according to the present invention.

Figure 7A is a partial perspective view of an alternative embodiment of the embodiment illustrated in **Figure 7.**

Figure 8 is a partial end view of an alternative embodiment of an edge interface connection according to the present invention.

Figure 9 is a partial perspective view of an additional embodiment of an edge interface connection according to the present invention.

Figure 10 is a partial perspective view of yet another embodiment of an edge interface connection according to the present invention.

Figure 11 is a partial perspective view of an additional embodiment of an edge interface connection according to the present invention.

Figure 11A illustrates one embodiment of the present invention as positioned prior to introduction of an external force thereon.

Figure 11B illustrates the interconnection of **Figure 11A** under an externally applied force.

Figure 11C illustrates the interconnection of **Figure 11A** after the force of **Figure 11B** has been removed.

Description of Preferred Embodiments

[0019] The present invention will now be described more fully hereinafter with reference to the accompanying figures, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Like numbers refer to like elements throughout. Dimensions may be exaggerated for clarity. As used herein, the term "printed circuit board" is meant to include any microelectronics packaging substrate.

[0020] **Figures 3** and **4** illustrate a preferred embodiment of the present invention. As shown in **Figure 4,** the radiotelephone **20** includes a rear housing member **30** and a front housing member **40.** The front and rear housing members **30, 40** are preferably sized and configured to matably connect together such that they form a channel or chamber **35** therebetween. A printed circuit board **50** is positioned in the channel **35** between the front and rear housing members **30, 40.** The radiotelephone **20** also typically includes a battery **60** associated therewith. Preferably, the battery **60** is mounted in a battery chamber **66** formed in an externally accessible and exposed surface of the rear housing **30.** Also as shown, the radiotelephone **20** includes at least one edge interface connector **75** for electrically connecting the battery **60** to the printed circuit board **50.**

[0021] The printed circuit board **50** comprises longitudinal and lateral surfaces and is positioned in the housing such that its longitudinal surfaces **(Figure 7A, 100)** extend parallel to a plane defined by lines which extend from the top to bottom and side to side of the radiotelephone when held in the hand of a user. As used herein, the lateral surfaces **110** of the printed circuit board are perpendicular to the longitudinal surfaces and can be defined by planes which extend across the width of a radiotelephone (front to back when held in the hand of a user). For example, a rectangular printed circuit board will have two external longitudinal surfaces (top and bottom) and four lateral surfaces (sides). The printed circuit is typically formed on one or more conductive layers of the board separated by insulating layers which comprise the longitudinal surfaces of the board. The lateral surfaces are typically the surfaces which form the edge perimeter walls of the board. Additionally, as shown in **Figure 5,** an aperture such as an elongated or circular "via" can be formed normal to the longitudinal surface of the board. Further, an intermediate via can be formed normal to the longitudinal surface and internal of the perimeter edges of the printed circuit board to define an intermediate lateral surface thereat (not shown).

[0022] As shown in **Figure 5,** the printed circuit board **50** includes a pair of battery edge contact pads **55** positioned on a lateral surface **110** (preferably an end lateral surface **110a).** The battery **60** also includes a corresponding pair of conductive end contacts **65** (**Figures 3** and **4**) preferably positioned on an end portion of the battery in close proximity to the rear housing member **30.** The edge interface connector **75** includes upper and lower contact portions **77, 78** which are in electrical communication. Each of the upper contact portions **77** engage with one of the battery contacts **55** and the lower contact portions **78** engage with a corresponding printed circuit board battery edge contact pad **55** to complete a battery circuit path therebetween. Advantageously, as shown in **Figure 7A,** the edge interface connection allows other components to be placed in close proximity to the edge contacts **55** without the need for keep-out zones as generally dictated by conventional designs. For example, conventional designs typically require a keep-out zone which includes not only the contact surface area, but mechanical attachment means of the contacts, and stack-up tolerances between the interconnected components such as between the printed circuit board and housing. Unfortunately, the various stack-up tolerances can be relatively substantial causing a rather large keep-out zone on valuable board space.

[0023] Referring again to **Figure 5,** the connector **75**

preferably includes a support body **76,** and is positioned to structurally hold an elongated contact spring **74** which defines the upper and lower contact portions **77, 78.** The elongated spring contact **74** allows a natural geometry benefit arising from the length of the lower portion **78** which provides increased spring flexibility or resilience for a more secure connection at the printed circuit board pad **55.** The length or configuration of the spring contact **74** provides a smooth force over a longer distance with an associated improved spring constant or (k) value. In the past, the surface area of the elbow or bend of the lower spring was typically sized to obtain a desirable length necessary to provide a desired spring constant value (k). Preferably, the support body **76** is constructed from a plastic, resin, or elastomer body and the upper and lower portions **77, 78** are preferably formed from resilient spring metal legs such as heat treated copper tungsten or beryllium copper. Also preferably, the spring contact upper and lower portions **77, 78** are a continuous length of resilient conductive material which is formed into a desired shape and then inserted (or molded) into the support body **76.**

[0024] The support body **76** can be assembled to the radiotelephone in any number of ways. Examples of suitable mounting techniques include heat staking, adhesives, and sizing the connector to press or snap fit into one of the housing members. Further, as will be recognized by one of skill in the art, the connector **75** can have many alternative configurations, such as, but not limited to, integrally forming the elongated spring contact **74** (or the upper and lower contact portions **77, 78)** in one of the housing members **30, 40** so that a separate support body **76** is not required (not shown).

[0025] The upper portion of the spring contact **78** is preferably configured to extend a predetermined distance out of the housing so that it can electrically contact with a device such as a battery or other accessory. In one preferred embodiment, as shown in **Figure 5A,** the upper portion **77** arcuately extends out of a first side of the support body **76a** while the lower portion **78** extends out of a second side of the support body **76b** which is adjacent the first side **76a.** This configuration positions the upper portion of the connector below or substantially flush with the top of the support body. Alternatively, as shown in **Figures 8** and **10,** the upper portion **77'** can extend out of a third side of the support housing **76c** such that it is above the support body **76.**

[0026] The lower portion of the spring contact **78** includes a lower electrical edge contact **78b** and a spring leg **78a.** The lower portion of the spring contact an also be configured in numerous ways. Exemplary configurations are illustrated in **Figures 5, 9,** and **10. Figure 5** illustrates one support body **76** with two vertically extending spring contacts **74. Figure 9** illustrates one support body **276** with two spring contact lower portions formed in an "L" shape **278.** The lower portions **278** include two segments a vertical segment **278a** and a horizontal segment **278b** which is angularly connected to the first segment (shown as 90 degrees). Advantageously, this configuration can provide increased spring flexibility or resilience. **Figure 10** shows an additional embodiment of a support body **376** with two horizontally extending elongated lower portions **378.** In one embodiment, the printed circuit board contact pad and lower spring contact **78b** are configured with complementary curvatures (**Figure 6**).

[0027] The support body **76** can also be configured in numerous ways. Exemplary support body configurations are shown in **Figures 3, 5, 10** and **11. Figure 3** illustrates a support body **76** with a side exiting upper portion **78. Figure 5** illustrates a horizontally elongated support body **176** holding two side exiting elongated spring contacts **74. Figure 10** illustrates a rectangular support body **376** with two top exiting upper portions **77'** and two horizontally extending lower portions **378. Figure 11** shows two separate housings **476,** each with a single elongated spring contact **74.**

[0028] This configuration advantageously allows the battery terminals to be separated a distance which will help prevent inadvertent short circuiting across same without sacrificing board space. For example, conventional models, when carried loosely in pockets and the like, can easily short circuit when metallic objects such as pens and car keys, contact the relatively closely spaced terminals either on the battery or phone systems connector. Advantageously, the present invention allows the battery contacts or systems connector contacts to be spaced-apart from the other at a distance that can reduce the likelihood of such an event. For example, as shown in **Figure 11,** the contacts **55** are positioned on opposing sides of the lateral contact surface **110** (the battery terminals are correspondingly separated on the battery). Preferably, the battery contacts **55** and correspondingly, the battery terminals **65** are spaced apart 1-4 centimeters. More preferably, they are spaced 3-4 centimeters apart in order to protect and separate the positive and negative terminals.

[0029] As shown in **Figures 11A-11C,** the edge interface contact **78b** on the lower portion of the spring **78** is positioned and held adjacent the printed circuit board **50** such that it is free to move about or overshoot the printed circuit board. Stated differently, it is free to extend and retract relative to the printed circuit board **50.** Thus, during a mechanical shock, if the spring contact **74** should undergo an elevated force, the lower portion of the spring contact **78** is not trapped by the printed circuit board and is free to extend in response to the forces introduced thereon. Advantageously, such a configuration minimizes the possibility for deformation of the edge contact **78b** and, as such, is able to maintain proper electrical contact with the contact pads on the printed circuit board **55** both during and after a mechanical shock

[0030] The edge contact on the printed circuit board **50** can be formed by a plated contact pad on the edge of the printed circuit board which is electrically connect-

ed to the desired circuit components on the printed circuit board. Preferably, the contact pads are formed by plated "via" hole technology which is well known to those of skill in the art. Generally described, a hole (normal to one or more of the longitudinal surfaces) is plated and certain layers (inner, surface, or both) of the printed circuit board (normal to the contact pad or via opening) are used to route the electrical connection to the appropriate location in the circuit path. Alternatively, an added component such as a U-shaped snap on connector can be positioned around an edge of the printed circuit board such that it contacts the top and /or bottom traces and provides the electrical connect pad on the board for the spring contact **74** (not shown). This type of configuration can reduce printed circuit board edge plating costs.

[0031] In a preferred embodiment, as shown in **Figures 5, 6,** and **7A,** one or more insets (or notches) **90, 91,** are formed in the edge contact area and the contact pads **55** are positioned therein. The insets allow the outer wall of the housing and printed circuit board to be positioned in closer proximity by adjusting the spring contact point **78b** to be positioned in a recessed area of the board. Preferably, the contact pads **55** include serrated edges to minimize trapped dust and the like which may interfere or degrade the electrical connection. Similarly, the spring contact portions **78b** can be dimpled to provide similar benefits.

[0032] Although the present invention has been described herein with two elongated spring contacts **74** either in a single or separated connector body **76,** it will be appreciated by those of skill in the art, that the present invention is not limited thereto. Indeed, a single edge interface connection, or more than two can easily be employed according to the present invention. Similarly, if multiple edge contacts are desired they may be placed on more than one lateral wall (different sides or edges of the printed circuit board).

[0033] It is also preferred that the battery be positioned on one end of the radiotelephone **20,** more preferably in the bottom to better access external battery rechargers such as base holders. Although described throughout as used to connect a battery, other devices can also be connected to the radiotelephone printed circuit board such as data input components, hands-free kit, in-phone battery chargers, and the like. Further, although primarily aimed at better contacts for cellular phone applications, the present invention is not limited thereto. Indeed, this interconnection technique can also be employed with other electronic devices such as calculators, portable music players, cordless phones, laptop computers, hand held video games, camcorders, and the like. Moreover, the edge interface contact or connection can be used for many applications such as, but not limited to, connections to speakers, microphones, displays, buzzers, systems, charging or AC ports, and the like. Advantageously, the connection can be designed into any comer or space of the product where space is typically unused (such as in extreme corners of telephones, adjacent to assembly screws and the like).

[0034] The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although a few exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. In the claims, means-plus-function clause are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Therefore, it is to be understood that the foregoing is illustrative of the present invention and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed embodiments, as well as other embodiments, are intended to be included within the scope of the appended claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.

Claims

1. A radiotelephone (20), comprising:

a front housing (40) member;
a rear housing member (30) configured to overlay and matably connect with said front housing member (40) to provide a channel (35) therebetween, said rear housing member (30) including a battery chamber (66) therein; and
a printed circuit board (50) having opposing top and bottom major surfaces and lateral surfaces (110) in the thickness direction, said lateral surfaces being generally perpendicular to said major surfaces,

characterised in that said printed circuit board is disposed in said channel intermediate of said front and rear housing members and has a pair of battery edge contact pads (55) disposed on at least one of said minor surfaces; and

by a plurality of elongated spring contacts (74) which extend in a direction which is generally perpendicular to said major surfaces of said printed circuit board, said spring contacts positioned in said housing rear member (30) such that said spring contacts electrically contact said printed circuit board battery edge contact pads (55).

2. A radiotelephone according to Claim 1, further comprising a battery (60) with positive and negative end contacts (65) thereon assembled in said battery chamber (66), wherein said positive and negative

end contacts (65) are spaced-apart a distance of about at least 3 centimeters.

3. A radiotelephone according to Claim 2, wherein said plurality of spring contacts include positive and negative spring contacts having upper and lower portions (77, 78), and wherein said battery (60) is positioned in said chamber such that the upper portions of said positive and negative spring contacts (77) engage said respective battery positive and negative end contacts (65) and'the lower end portions (78) contact respective ones of said battery edge contact pads (55) on said printed circuit board (50) defining a battery circuit therebetween.

4. A radiotelephone according to Claim 1, wherein said elongated spring contacts (74) have a spring component (78a) which, in position, extends in a direction which is toward and generally parallel to said printed circuit board major surfaces, and wherein said elongated spring contacts (74) are configured to allow sliding movement relative to the surface of said battery edge contact pads (55) such that said elongated spring contacts (74) can translate below one or more of said top and bottom major surfaces of said printed circuit board.

5. A radiotelephone according to Claim 1, wherein said printed circuit board battery edge contact pads (55) are positioned in at least one cutaway inset (90,91) in an end of said printed circuit board (50).

6. A radiotelephone according to Claim 1, wherein said elongated spring contacts (74) include upper and lower portions (77, 78), and wherein said elongated spring contacts include at least one support body (76) positioned between the upper (77) and lower (78) portions of said elongated spring contacts (74).

7. A radiotelephone according to Claim 6, wherein said support body (76) is integral to an end portion of said rear housing member (30).

8. A radiotelephone according to Claim 6, wherein said plurality of elongated spring contacts (74) comprise first and second elongated spring contacts.

9. A radiotelephone according to Claim 8, wherein said first and second elongated spring contact lower portions (78) are spatially separate and each extends out from said support body (76) such that, in position, they are substantially parallel to a lateral surface of said printed circuit board (50) to contact and electrically engage with a selected one of said printed circuit board battery contact pads (55) positioned on at least one of said lateral surfaces.

10. A radiotelephone according to Claim 6, wherein said first and second elongated spring contact lower portions laterally extend out from opposing transverse sides of said support body (376) such that, in position, said lower portions (378) laterally extend in opposing directions across a portion of at least one of said lateral surfaces of said printed circuit board such that said lower portions are configured to provide sliding movement relative to the surface of said printed circuit board lateral edge contact pads in a manner which allows said lower portions to translate below said longitudinal surfaces of said printed circuit board.

11. A radiotelephone according to Claim 6, wherein said first and second elongated spring contact lower portions (278) extend generally perpendicularly out from the bottom side of said support body (276), and wherein said lower portions are configured in an L shape such that, in position, each of the bottom of said L shaped lower portions (278B) laterally extend in opposing directions across a portion of at least one of said lateral surfaces of said printed circuit board such that said bottom of said L shaped lower portions (278B) are configured to provide sliding movement relative to the surface of said printed circuit board lateral edge contact pads in a manner which allows said bottom of said L shaped lower portions to translate below said longitudinal surfaces of said printed circuit board (50).

12. A radiotelephone according to Claim 6, wherein said at least one support body (76) is two separate support bodies.

13. An edge interface electrical connection (75), comprising:

a connector support body (76) having first and second sides;
at least one connector upper contact (77) extending from a first side (76C) of said support body;
at least one connector lower contact (78) extending from a second side of said support body, wherein each of said connector upper contacts (77) are electrically connected to corresponding ones of said at least one connector lower contacts (78);
a printed circuit board (50) having longitudinal and lateral surfaces,

characterised in that the printed circuit board comprises at least one lateral edge contact pad (55) on at least one lateral surface, wherein said connector lower contact extends from said support body (76) in a direction which is generally perpendicular to said printed circuit board longitu-

dinal surface to rest against and electrically connect with said printed circuit board lateral edge contact pad (55).

14. An edge interface electrical connection according to Claim 13, wherein said connector upper contact (77) arcuately extends from the first side of said support body (76C).

15. An edge interface electrical connection according to Claim 13, wherein said connector support body second side is a bottom side, and wherein said connector lower contact (78, 278) extends substantially perpendicularly to said longitudinal printed circuit board surface downward from said bottom side of said support body, and wherein, in position, said lower contact (78) is configured to provide sliding movement relative to the surface of said printed circuit board lateral edge contact pad (55) such that said lower contact can translate below said longitudinal surfaces of said printed circuit board.

16. An edge interface electrical connection according to Claim 13, wherein said connector support body second side is a transverse side, and wherein said connector lower contact (278) laterally extends out from said transverse side of said support body (76; 276) such that, in position, said lower contact laterally extends across a portion of at least one of said lateral surfaces of said printed circuit board such that said lower contact is configured to provide sliding movement relative to the surface of said printed circuit board lateral edge contact pad (55) in a manner which allows said lower contact to translate below said longitudinal surfaces of said printed circuit board.

17. An edge interface electrical connection according to Claim 13, wherein said connector lower contact includes first (278a) and second segments (278b) such that said second segment extends at an angle with respect to said first segment and wherein said second segment (278b) engages with said lateral edge contact (55) and is free to extend upwardly and downwardly about said printed circuit board (50) in response to forces exerted thereon.

18. An edge interface electrical connection according to Claim 13, wherein wherein said printed circuit board (50) includes electrical contact pads positioned in at least one cutaway inset (90, 91) in said printed circuit board (50).

19. An edge interface electrical connection according to Claim 13, wherein said at least one upper and lower connector contact is two spaced apart connect contacts (78, 278, 378), each of the upper connector contacts being spaced apart and each of the lower connector contacts being spaced apart, and wherein each upper connector contact is electrically connected to a corresponding lower connector contact.

20. An edge interface electrical connection according to Claim 19, wherein said two spaced apart connector contacts (78, 278, 378) define positive and negative power source contacts.

21. An edge interface electrical connection according to Claim 20, wherein each of said upper contacts (77) are configured to engage with terminals of a power source.

22. An edge interface electrical connection according to Claim 19, wherein at least one lateral edge contact pad of said printed circuit board comprises first and second contact pads (55) positioned such that each is spaced-apart from each other on one lateral side of said printed circuit board, and wherein each of said two electrically separate connector lower contacts (78) engages a respective one of said first or second printed circuit board lateral edge contact pads.

Patentansprüche

1. Funktelefon (20), umfassend:

ein vorderes Gehäuseteil (40);
ein hinteres Gehäuseteil (30), das konfiguriert ist, auf dem vorderen Gehäuseteil (40) zu liegen, und damit passend verbunden zu sein, um einen Kanal (35) dazwischen zur Verfügung zu stellen, wobei das hintere Gehäuseteil (30) eine Batteriekammer (66) darin einschließt; und
eine gedruckte Schaltungsplatine (50) mit gegenüberliegenden oberen und unteren Hauptoberflächen und lateralen Oberflächen (110) in der Dickenrichtung, wobei die lateralen Oberflächen im allgemeinen rechtwinkelig zu den Hauptoberflächen sind,

dadurch gekennzeichnet, dass

die gedruckte Schaltungsplatine in dem Kanal zwischen dem vorderen und dem hinteren Gehäuseteil angeordnet ist und ein Paar von Batteriekantenkontaktflächen (55) aufweist, die an wenigstens einer der Nebenoberflächen angeordnet sind; und

durch eine Vielzahl von länglichen Federkontakten (74), die sich in einer Richtung erstrekken, die im allgemeinen rechtwinkelig zu den Hauptoberflächen der gedruckten Schaltungs-

platine ist, wobei die Federkontakte in dem hinteren Gehäuseteil (30) so positioniert sind, dass die Federkontakte die Batteriekantenkontaktflächen (55) der gedruckten Schaltungsplatine elektrisch kontaktieren.

2. Funktelefon nach Anspruch 1, **gekennzeichnet durch** eine Batterie (60) mit positiven und negativen Endkontakten (65) daran, in die Batteriekammer (66) gebaut, wobei die positiven und negativen Endkontakte (65) in einer Entfernung von wenigstens 3 cm beabstandet sind.

3. Funktelefon nach Anspruch 2, **dadurch gekennzeichnet, dass** die Vielzahl von Federkontakten positive und negative Federkontakte mit oberen und unteren Abschnitten (77, 78) einschließen, und worin die Batterie (60) in der Kammer so positioniert ist, dass die oberen Abschnitte der positiven und negativen Federkontakte (77) in Eingriff stehen mit den jeweiligen positiven und negativen Endkontakten (65) der Batterie, und die unteren Endabschnitte (78) jeweilige Batteriekantenkontaktflächen (55) auf der gedruckten Schaltungsplatine (50) kontaktieren, die einen Batterieschaltkreis dazwischen definieren.

4. Funktelefon nach Anspruch 1, **dadurch gekennzeichnet, dass** die länglichen Federkontakte (74) eine Federkomponente (78a) aufweisen, welche sich in Position in einer Richtung erstreckt, die im allgemeinen parallel und hin zu den Hauptoberflächen der gedruckten Schaltungsplatine ist, und worin die länglichen Federkontakte (74) konfiguriert sind, eine gleitende Bewegung relativ zu der Oberfläche der Batteriekantenkontaktflächen (55) zu gestatten, so dass sich die länglichen Federkontakte (74) unter eine oder mehrere der oberen und unteren Hauptoberflächen der gedruckten Schaltungsplatine bewegen können.

5. Funktelefon nach Anspruch 1, **dadurch gekennzeichnet, dass** die Batteriekantenkontaktflächen (55) der gedruckten Schaltungsplatine in wenigstens einer weggeschnittenen Ausnehmung (90, 91) in einem Ende der gedruckten Schaltungsplatine (50) positioniert sind.

6. Funktelefon nach Anspruch 1, **dadurch gekennzeichnet, dass** die länglichen Federkontakte (74) obere und untere Abschnitte (77, 78) einschließen, und die länglichen Federkontakte wenigstens einen Haltekörper. (76) einschließen, der zwischen den oberen (77) und unteren (78) Abschnitten der länglichen Federkontakte (74) positioniert ist.

7. Funktelefon nach Anspruch 6, **dadurch gekennzeichnet, dass** der Haltekörper (76) mit einem Endabschnitt des hinteren Gehäuseteils (30) einteilig ist.

8. Funktelefon nach Anspruch 6, **dadurch gekennzeichnet, dass** die Vielzahl von länglichen Federkontakten (74) erste und zweite längliche Federkontakte umfassen.

9. Funktelefon nach Anspruch 8, **dadurch gekennzeichnet, dass** die unteren Abschnitte (78) der ersten und zweiten länglichen Federkontakte räumlich separat sind, und sich jeder von dem Haltekörper (76) heraus erstreckt, so dass sie in Position im wesentlichen parallel zu einer lateralen Oberfläche der gedruckten Schaltungsplatine (50) sind, um eine ausgewählte der Batteriekontaktflächen (55) der gedruckten Schaltungsplatine, die an wenigstens einer der lateralen Oberflächen positioniert sind, zu kontaktieren und damit elektrisch in Eingriff zu treten.

10. Funktelefon nach Anspruch 6, **dadurch gekennzeichnet, dass** sich die unteren Abschnitte der ersten und zweiten länglichen Federkontakte lateral von gegenüberliegenden Querseiten des Haltekörpers (376) heraus erstrecken, so dass die unteren Abschnitte (378) sich in Position lateral in gegenüberliegende Richtungen über eine Abschnitt von wenigstens einer der lateralen Oberflächen der gedruckten Schaltungsplatine erstrecken, so dass die unteren Abschnitte konfiguriert sind, eine Gleitbewegung relativ zur Oberfläche der lateralen Kantenkontaktflächen der gedruckten Schaltungsplatine in einer Weise vorzusehen, die es gestattet, dass sich die unteren Abschnitte unter die longitudinalen Oberflächen der gedruckten Schaltungsplatine bewegen.

11. Funktelefon nach Anspruch 6, **dadurch gekennzeichnet, dass** sich die unteren Abschnitte (278) der ersten und zweiten länglichen Federkontakte im wesentlichen rechtwinkelig aus der Unterseite des Haltekörpers (276) heraus erstrecken, und die unteren Abschnitte L-förmig konfiguriert sind, so dass sich jeder der Unterteile der L-förmigen unteren Abschnitte (278B) In Position lateral in entgegengesetzten Richtungen über einen Abschnitt von wenigstens einer der lateralen Oberflächen der gedruckten Schaltungsplatine erstrecken, so dass das Unterteil der L-förmigen unteren Abschnitte (278B) konfiguriert sind, eine Gleitbewegung relativ zur Oberfläche der lateralen Kantenkontaktflächen der gedruckten Schlatungsplatine in einer Weise vorzusehen, welche es gestattet, dass sich die Unterteile der L-förmigen unteren Abschnitte unter die longitudinalen Oberflächen der gedruckten Schaltungsplatine (50) bewe-

gen.

12. Funktelefon nach Anspruch 6,
dadurch gekennzeichnet, dass der wenigstens eine Haltekörper (76) zwei separate Haltekörper umfasst.

13. Eine elektrische Kantenschnittstellenverbindung (75), umfassend:

einen Verbinderhaltekörper (76) mit ersten und zweiten Seiten;
wenigstens einen oberen Verbinderkontakt (77), der sich von einer ersten Seite (76C) des Haltekörpers erstreckt; wenigstens einen unteren Verbinderkontakt (78), der sich von einer zweiten Seite des Haltekörpers erstreckt, worin die oberen Verbinderkontakte (77) elektrisch mit entsprechenden der wenigstens einen unteren Verbinderkontakte (78) verbunden sind;
eine gedruckte Schaltungsplatine (50) mit longitudinalen und lateralen Oberflächen,

dadurch gekennzeichnet, dass die gedruckte Schaltungsplatine wenigstens eine laterale Kantenkontaktfläche (55) auf wenigstens einer lateralen Oberfläche umfasst, worin sich der unter Verbinderkontakt von dem Haltekörper (76) in einer Richtung erstreckt, die im wesentlichen rechtwinkelig zur longitudinalen Oberfläche der gedruckten Schaltungsplatine ist, um an der lateralen Kantenkontaktfläche (55) anzuliegen und daran elektrisch anzuschließen.

14. Elektrische Kantenschnittstellenverbindung nach Anspruch 13,
dadurch gekennzeichnet, dass sich der obere Kontakt (77) des Verbinders gebogen von der ersten Seite des Haltekörpers (76C) erstreckt.

15. Elektrische Kantenschnittstellenverbindung nach Anspruch 13,
dadurch gekennzeichnet, dass die zweite Seite des Verbinder-Haltekörpers eine Unterseite ist, und der untere Kontakt (78, 278) des Verbinders sich im wesentlichen rechtwinkelig zur longitudinalen Oberfläche der gedruckten Schaltungsplatine abwärts von der Unterseite des Haltekörpers erstreckt, und worin der untere Kontakt (78) in Position konfiguriert ist, eine Gleitbewegung relativ zur Oberfläche der lateralen Kantenkontaktfläche (55) der gedruckten Schaltungsplatine zu ermöglichen, so dass der untere Kontakt sich unter die longitudinalen Oberflächen der gedruckten Schaltungsplatine bewegen kann.

16. Elektrische Kantenschnittstellenverbindung nach Anspruch 13,
dadurch gekennzeichnet, dass die zweite Seite des Verbinder-Haltekörpers eine transversale Seite ist, und sich der untere Kontakt (278) des Verbinders lateral von der transversalen Seite des Haltekörpers (76; 276) heraus erstreckt, so dass sich der untere Kontakt in Position lateral über einen Abschnitt wenigstens einer der lateralen Oberflächen der gedruckten Schaltungsplatine erstreckt, so dass der untere Kontakt konfiguriert ist, eine Gleitbewegung relativ zur Oberfläche der lateralen Kantenkontaktfläche (55) der gedruckten Schaltungsplatine in einer Weise zu ermöglichen, welche es gestattet, dass sich der untere Kontakt unter die longitudinalen Oberflächen der gedruckten Schaltungsplatine bewegt.

17. Elektrische Kantenschnittstellenverbindung nach Anspruch 13,
dadurch gekennzeichnet, dass der untere Kontakt des Verbinders erste (278a) und zweite (278b) Segmente einschließt, so dass sich das zweite Segment in bezug auf das erste Segment in einem Winkel erstreckt, und worin das zweite Segment (278b) mit dem lateralen Kantenkontakt (55) in Eingriff steht, und sich an der gedruckten Schaltungsplatine (50) aufwärts und abwärts als Reaktion auf darauf ausgeübte Kräfte erstrecken kann.

18. Elektrische Kantenschnittstellenverbindung nach Anspruch 13,
dadurch gekennzeichnet, dass die gedruckte Schaltungsplatine (50) elektrische Kontaktflächen einschließt, die in wenigstens einer Ausnehmung (90, 91) in der gedruckten Schaltungsplatine (50) positioniert sind.

19. Elektrische Kantenschnittstellenverbindung nach Anspruch 13,
dadurch gekennzeichnet, dass der wenigstens eine obere und untere Verbinderkontakt zwei beabstandete Verbinderkontakte (78, 278, 378) sind, wobei jeder der oberen Verbinderkontakte beabstandet ist, und jeder der unteren Verbinderkontakte beabstandet ist, und worin jeder obere Verbinderkontakt elektrisch mit einem entsprechenden unteren Verbinderkontakt verbunden ist.

20. Elektrische Kantenschnittstellenverbindung nach Anspruch 19,
dadurch gekennzeichnet, dass die beiden beabstandeten Verbinderkontakte (78, 278, 378) positive und negative Stromquellenkontakte definieren.

21. Elektrische Kantenschnittstellenverbindung nach Anspruch 20,
dadurch gekennzeichnet, dass jeder obere Kontakt (77) konfiguriert ist, mit Anschlüssen einer Stromquelle in Eingriff zu treten.

22. Elektrische Kantenschnittstellenverbindung nach Anspruch 19,
dadurch gekennzeichnet, dass wenigstens eine laterale Kantenkontaktfläche der gedruckten Schaltungsplatine erste und zweite Kontaktflächen (55) umfasst, die so positioniert sind, dass sie voneinander auf einer lateralen Seite der gedruckten Schaltungsplatine beabstandet sind, und jeder der beiden elektrisch separaten, unteren Verbinderkontakte in Eingriff steht mit einer jeweiligen der ersten oder zweiten lateralen Kantenkontaktflächen der gedruckten Schaltungsplatine.

Revendications

1. Radiotéléphone (20), comprenant :

un élément avant (40) de boîtier ;
un élément arrière (30) de boîtier configuré pour recouvrir et s'accoupler de manière complémentaire avec ledit élément avant (40) de boîtier pour réaliser un canal (35) entre eux, ledit élément arrière (30) de boîtier incluant à l'intérieur de celui-ci une chambre (66) de batterie ; et
une carte à circuit imprimé (50) comportant des surfaces principales supérieure et inférieure opposées et
des surfaces latérales (110) dans la direction de l'épaisseur, lesdites surfaces latérales étant globalement perpendiculaires auxdites surfaces principales,

caractérisé en ce que ladite carte à circuit imprimé est disposée dans ledit canal entre lesdits éléments avant et arrière de boîtier et comporte une paire de plages de contact de bord (55) de batterie disposées sur au moins l'une desdites surfaces secondaires ; et

par une pluralité de contacts à ressort allongés (74) qui s'étendent dans une direction qui est globalement perpendiculaire auxdites surfaces principales de ladite carte à circuit imprimé, lesdits contacts à ressort étant placés dans ledit élément arrière (30) de boîtier de sorte que lesdits contacts à ressort contactent électriquement lesdites plages de contact de bord (55) de batterie de carte à circuit imprimé.

2. Radiotéléphone selon la revendication 1, comprenant en outre une batterie (60) portant des contacts d'extrémité positif et négatif (65) assemblés dans ladite chambre (66) de batterie, dans lequel lesdits contacts d'extrémité positif et négatif (65) sont espacés d'une distance d'environ au moins 3 centimètres.

3. Radiotéléphone selon la revendication 2, dans lequel ladite pluralité de contacts à ressort comprend des contacts à ressort positif et négatif comportant des parties supérieure et inférieure (77, 78), et dans lequel ladite batterie (60) est placée dans ladite chambre, de sorte que les parties supérieures desdits contacts à ressort positif et négatif (77) engagent lesdits contacts à ressort d'extrémité positif et négatif respectifs (65) de batterie et que lesdites parties inférieures (78) d'extrémité contactent celles, respectives, desdites plages de contact de bord (55) de batterie situées sur ladite carte à circuit imprimé (50), en définissant, entre elles, un circuit de batterie.

4. Radiotéléphone selon la revendication 1, dans lequel lesdits contacts à ressort allongés (74) comportent un composant de ressort (78a) qui, en position, s'étend dans une direction qui va vers lesdites surfaces principales de carte à circuit imprimé et globalement parallèlement à celles-ci, et dans lequel lesdits contacts à ressort allongés (74) sont configurés pour permettre un déplacement glissant par rapport à la surface desdites plages de contact de bord (55) de batterie, de sorte que lesdits contacts à ressort allongés (74) peuvent se déplacer au-dessous de l'une, ou de plusieurs, desdites surfaces principales supérieure et inférieure de ladite carte à circuit imprimé.

5. Radiotéléphone selon la revendication 1, dans lequel lesdites plages de contact de bord (55) de batterie de carte à circuit imprimé sont placées dans au moins une découpe (90, 91) réalisée dans une extrémité de ladite carte à circuit imprimé (50).

6. Radiotéléphone selon la revendication 1, dans lequel lesdits contacts à ressort allongés (74) comprennent des parties supérieure et inférieure (77, 78), et dans lequel lesdits contacts à ressort allongés comprennent au moins un corps (76) de support placé entre les parties supérieure (77) et inférieure (78) desdits contacts à ressort allongés (74).

7. Radiotéléphone selon la revendication 6, dans lequel ledit corps (76) de support est d'un seul tenant avec une partie d'extrémité dudit élément arrière (30) de boîtier.

8. Radiotéléphone selon la revendication 6, dans lequel ladite pluralité de contacts à ressort allongés (74) comprend des premier et second contacts à ressort allongés.

9. Radiotéléphone selon la revendication 8, dans lequel lesdites parties inférieures (78) de premier et second contacts à ressort allongés sont espacées spatialement, et chacune s'étend hors dudit corps

(76) de support de sorte que, en position, elles sont sensiblement parallèles à une surface latérale de ladite carte à circuit imprimé (50) pour contacter et engager électriquement l'une, choisie, desdites plages de contact (55) de batterie de carte à circuit imprimé placées sur au moins l'une desdites surfaces latérales.

10. Radiotéléphone selon la revendication 6, dans lequel lesdites parties inférieures de premier et second contacts à ressort allongés s'étendent latéralement hors de côtés transversaux opposés dudit corps (376) de support, de sorte que, en position, lesdites parties inférieures (378) s'étendent latéralement dans des directions opposées de part et d'autre d'une partie d'au moins l'une desdites surfaces latérales de ladite carte à circuit imprimé, de façon que lesdites parties inférieures soient configurées pour fournir un déplacement glissant par rapport à la surface desdites plages de contact de bord latéral de carte à circuit imprimé d'une manière qui permet un déplacement desdites parties inférieures au-dessous desdites surfaces longitudinales de ladite carte à circuit imprimé.

11. Radiotéléphone selon la revendication 6, dans lequel lesdites parties inférieures (278) de premier et second contacts à ressort allongés s'étendent globalement perpendiculairement hors du côté inférieur dudit corps (276) de support, et dans lequel lesdites parties inférieures sont configurées en une forme de L, de sorte que, en position, chacune desdites parties inférieures en forme de L (278B) s'étend latéralement dans des directions opposées de part et d'autre d'une partie d'au moins l'une desdites surfaces latérales de ladite carte à circuit imprimé, de sorte que ladite partie inférieure desdites parties inférieures en forme de L (278B) est configurée pour fournir un déplacement glissant par rapport à la surface desdites plages de contact de bord latéral de carte à circuit imprimé, d'une manière qui permet un déplacement de ladite partie inférieure desdites parties inférieures en forme de L au-dessous desdites surfaces longitudinales de ladite carte à circuit imprimé (50).

12. Radiotéléphone selon la revendication 6, dans lequel ledit au moins un corps (76) de support est constitué de deux corps de support distincts.

13. Connexion électrique (75) d'interface de bord, comprenant :

un corps (76) de support de connecteur comportant des premier et second côtés ;
au moins un contact supérieur (77) de connecteur s'étendant d'un premier côté (76C) dudit corps de support ;
au moins un contact inférieur (78) de connecteur s'étendant d'un second côté dudit corps de support, dans lequel chacun desdits contacts supérieurs (77) de connecteur est connecté électriquement à celui, correspondant, d'au moins l'un desdits contacts inférieurs (78) de connecteur ;
une carte à circuit imprimé (50) comportant des surfaces longitudinales et latérales,

caractérisée en ce que la carte à circuit imprimé comprend au moins une plage de contact de bord latéral (55) sur au moins une surface latérale, dans laquelle ledit contact inférieur de connecteur s'étend dudit corps (76) de support dans une direction qui est globalement perpendiculaire à ladite surface longitudinale de carte à circuit imprimé pour reposer contre ladite plage de contact de bord latéral (55) de carte à circuit imprimé et être connectée électriquement avec celle-ci.

14. Connexion électrique d'interface de bord selon la revendication 13, dans laquelle ledit contact supérieur (77) de connecteur s'étend suivant un arc du premier côté dudit corps (76C) de support.

15. Connexion électrique d'interface de bord selon la revendication 13, dans laquelle ledit second côté de corps de support de connecteur est un côté inférieur, et dans laquelle ledit contact inférieur (78 ; 278) s'étend sensiblement perpendiculairement à ladite surface longitudinale de carte à circuit imprimé vers le bas dudit côté inférieur dudit corps de support, et dans laquelle, en position, ledit contact inférieur (78) est configuré pour fournir un déplacement glissant par rapport à la surface de ladite plage de contact de bord latéral (55) de carte à circuit imprimé, de sorte que ledit contact inférieur peut se déplacer au-dessous desdites surfaces longitudinales de ladite carte à circuit imprimé.

16. Connexion électrique d'interface de bord selon la revendication 13, dans laquelle ledit second côté de corps de support de connecteur est un côté transversal, et dans laquelle ledit contact inférieur (278) de connecteur s'étend latéralement hors dudit côté transversal dudit corps (76 ; 276) de support, de sorte que, en position, ledit contact inférieur s'étend latéralement de part et d'autre d'une partie d'au moins l'une desdites surfaces latérales de ladite carte à circuit imprimé, de façon que ledit contact inférieur soit configuré pour fournir un déplacement glissant par rapport à la surface de ladite plage de contact de bord latéral (55) de carte à circuit imprimé, d'une manière qui permet un déplacement dudit contact inférieur au-dessous desdites surfaces longitudinales de ladite carte à circuit imprimé.

17. Connexion électrique d'interface de bord selon la revendication 13, dans laquelle ledit contact inférieur de connecteur comprend des premier (278a) et second (278b) segments de façon que ledit second segment s'étende à un angle par rapport audit premier segment, et dans laquelle ledit second segment (278b) engage ledit contact de bord latéral (55) et est libre de s'étendre vers le haut et vers le bas autour de ladite carte à circuit imprimé (50) en réponse à des forces exercées sur celui-ci.

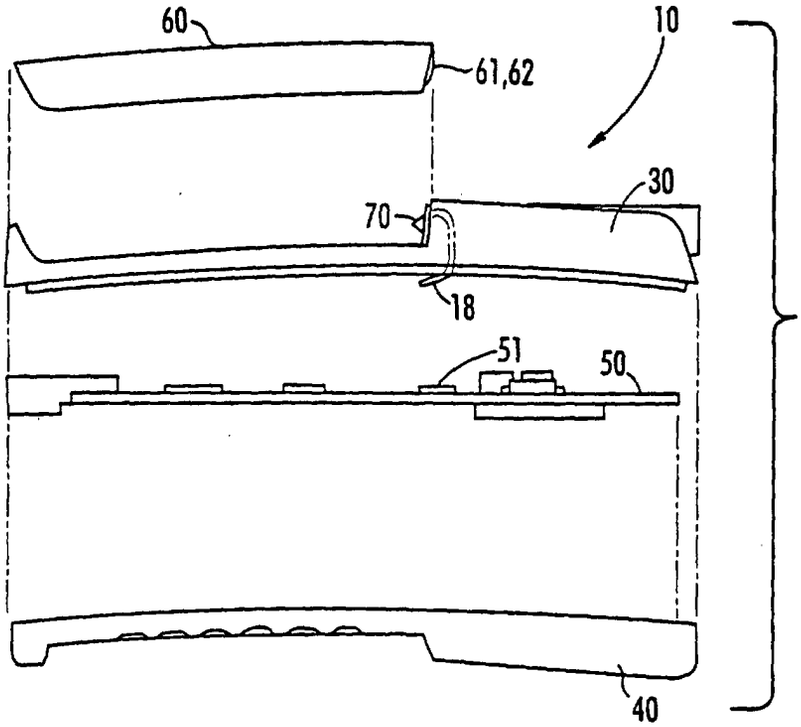
18. Connexion électrique d'interface de bord selon la revendication 13, dans laquelle ladite carte à circuit imprimé (50) comprend des plages de contact électrique placées dans au moins une découpe (90, 91) réalisée dans ladite carte à circuit imprimé (50).

19. Connexion électrique d'interface de bord selon la revendication 13, dans laquelle au moins un contact supérieur et inférieur de connecteur est constitué de deux contacts espacés (78, 278, 378) de connexion, chacun des contacts supérieurs de connecteur étant espacé et chacun des contacts inférieurs de connecteur étant espacé, et dans laquelle chaque contact supérieur de connecteur est connecté électriquement à un contact inférieur de connecteur correspondant.

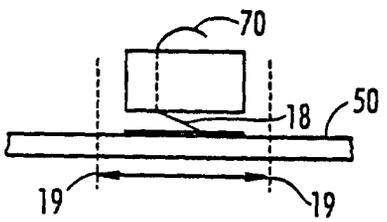
20. Connexion électrique d'interface de bord selon la revendication 19, dans laquelle lesdits deux contacts espacés de connecteur définissent des contacts (78, 278, 378) de source de courant positif et négatif.

21. Connexion électrique d'interface de bord selon la revendication 20, dans laquelle chacun desdits contacts supérieurs (77) est configuré pour engager des bornes d'une source de courant.

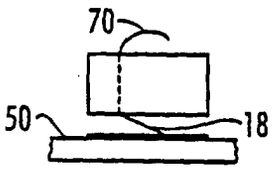
22. Connexion électrique d'interface de bord selon la revendication 19, dans laquelle au moins une plage de contact de bord latéral de ladite carte à circuit imprimé comprend des première et seconde plages de contact (55) placées de sorte que chacune soit espacée de l'autre sur un côté latéral de ladite carte à circuit imprimé, et dans laquelle chacun desdits deux contacts inférieurs (78) de connecteur électriquement distincts engage l'une, respective, desdites première ou seconde plages de contact de bord latéral de carte à circuit imprimé.



PRIOR ART
FIG. 1A

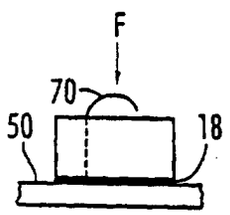


PRIOR ART
FIG. 1B



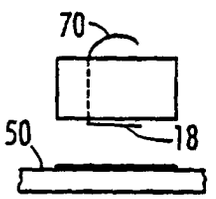
(BEFORE)

PRIOR ART
FIG. 2A



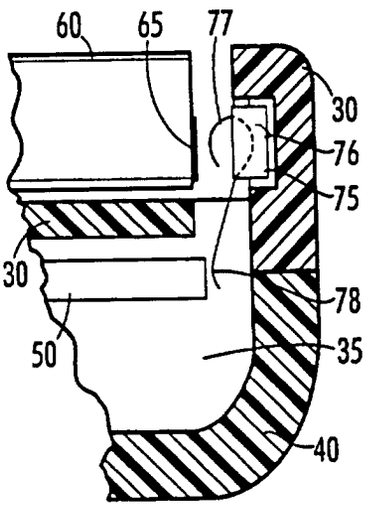
(DURING)

PRIOR ART
FIG. 2B



(AFTER)

PRIOR ART
FIG. 2C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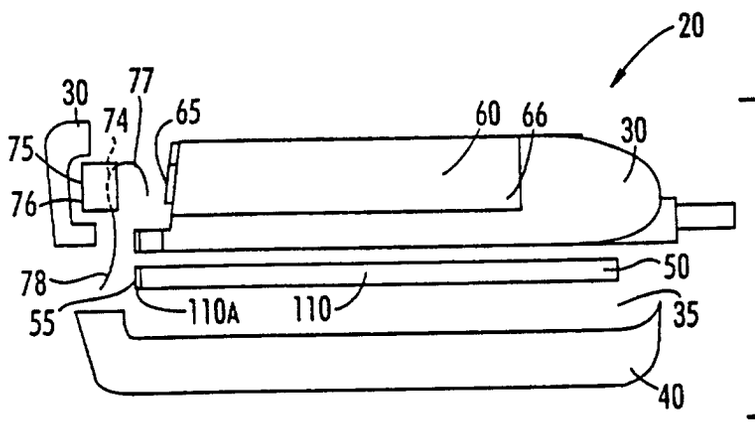
35
40

FIG. 3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78
50
55
110A
110
35
40

FIG. 4

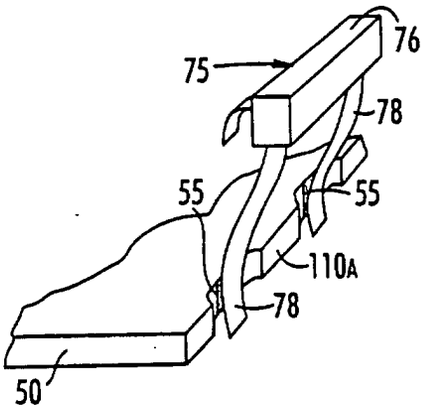


FIG. 5

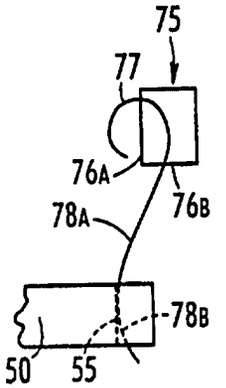


FIG. 5A

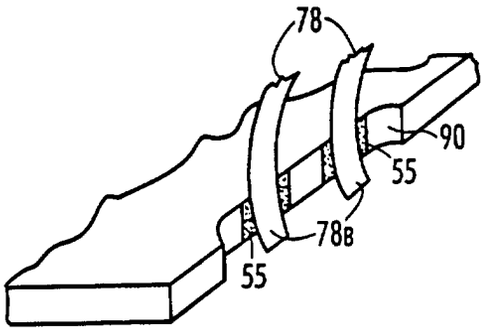


FIG. 6

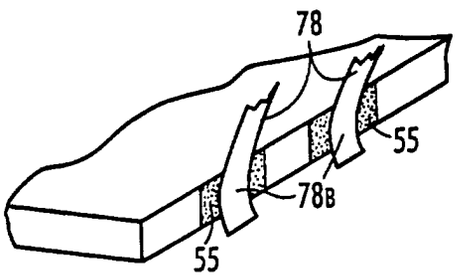


FIG. 7

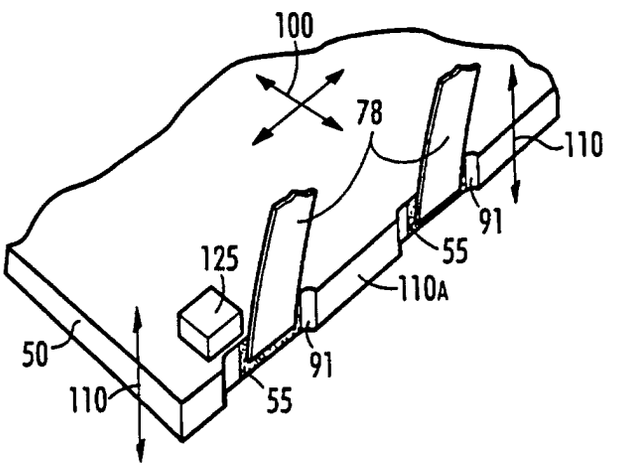


FIG. 7A

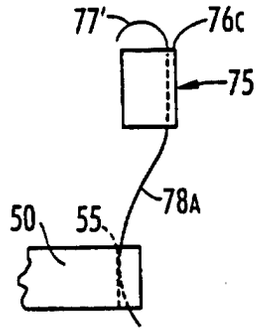


FIG. 8

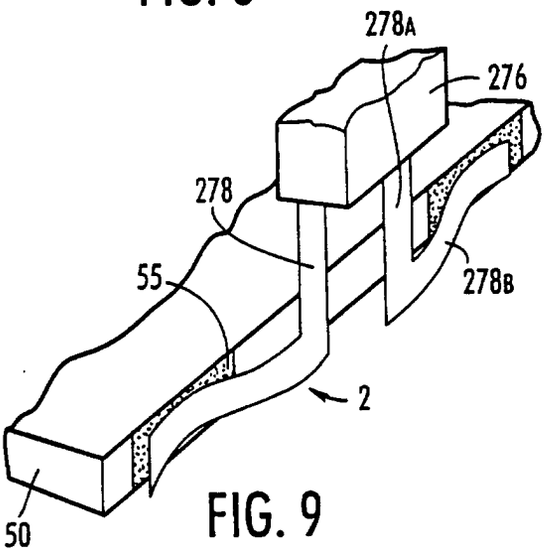


FIG. 9

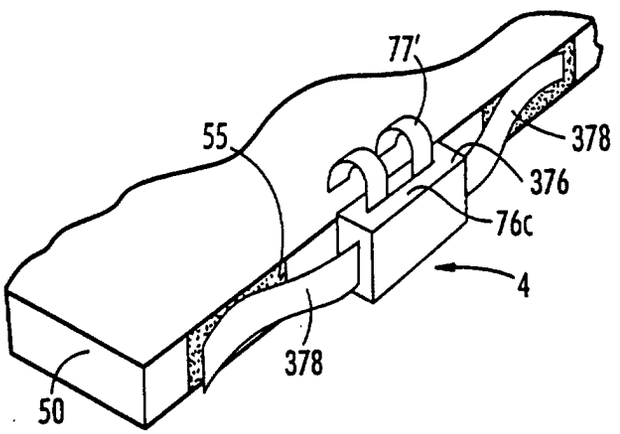
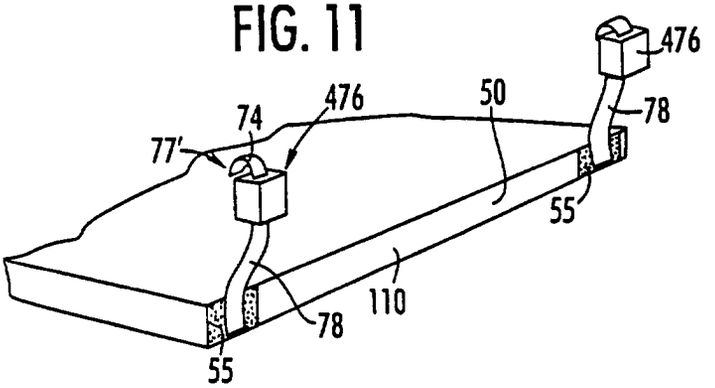
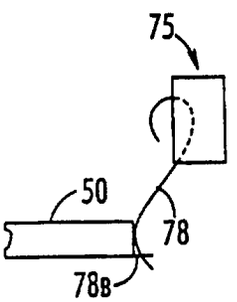


FIG. 10

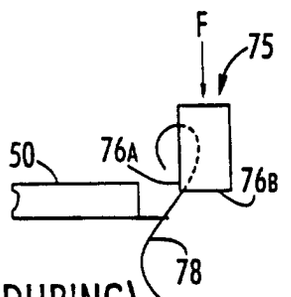
FIG. 11





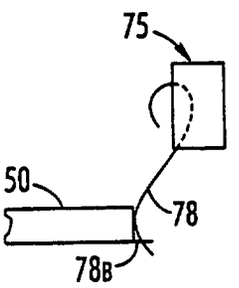
(BEFORE)

FIG. 11A



(DURING)

FIG. 11B



(AFTER)

FIG. 11C